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Can cigarette taxes during pregnancy mitigate the intergenerational transmission of socioeconomic status?☆

Sonja Settele[a,*], Reyn van Ewijk[b]

[a] Management and Microeconomics Group, Goethe University Frankfurt, Germany
[b] Chair of Statistics and Econometrics, Gutenberg University Mainz, Germany

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ABSTRACT

Smoking during pregnancy is most prevalent among women with a low socioeconomic status and is negatively associated with important infant health measures such as birth weight. Cigarette taxes decrease smoking among pregnant women and lead to improved birth outcomes, especially among those with a low socioeconomic status. In this paper we investigate whether increasing cigarette taxes also translates into improved educational attainment of offspring from a low socioeconomic background. In order to answer this question, we exploit variation in cigarette taxes across U.S. states over time and analyze tax effects on grade retention and school enrollment among a large sample of adolescents representative of the population. We find that higher cigarette taxes during pregnancy are strongly associated with improved educational outcomes of children from a low socioeconomic background, but seem to have no effect on children from a higher socioeconomic background. Our findings therefore suggest that cigarette taxes can be an effective policy instrument for mitigating the propagation of a low socioeconomic status from one generation to the next.

1. Introduction

Important life outcomes such as health, education and income are highly correlated across generations. Consequently, socioeconomic inequalities are persistent (Aizer and Currie, 2014; Case et al., 2002; Currie, 2009; 2011; Currie and Hyson, 1999). Already by the time of birth, socioeconomic gradients are sizeable. This can be measured by the birth weight of infants, which is the best available proxy for newborn health and a powerful predictor of later life outcomes such as education, later life health (Case et al., 2005; Currie, 2009), life expectancy (Van den Berg et al., 2006; Oreopoulos et al., 2008) and labor market outcomes (Behrman and Rosenzweig, 2004; Black et al., 2007; Currie and Hyson, 1999). Reasons for such early gradients include access to and use of medical care and family planning, environmental factors such as pollution, the mother's health and her nutrition during pregnancy as well as health behaviors such as smoking (Aizer and Currie, 2014; Currie, 2009). Mothers from less advantaged socioeconomic backgrounds on average do worse on all of these factors (Aizer and Currie, 2014; Cutler and Lleras-Muney, 2010; Phares et al., 2004).

Public health professionals have identified smoking during pregnancy as the largest risk factor for low birth weight that can be modified by maternal behavior (Kramer, 1987; Shiono and Behrman, 1995). Moreover, socioeconomic differences in this health behavior are large: Smoking rates in the U.S. are around seven times higher for the lowest income group than for the highest income group (CDC, 2016).[1] Smoking is therefore a potential channel for the propagation of socioeconomic inequalities from one generation to the next. Cigarette taxes, in turn, have been shown to reduce smoking during pregnancy, leading to improved birth outcomes (Evans and Ringel, 1999). Reactions to tax increases have been shown to be stronger amongst women with a low socioeconomic status due to a higher incidence of smoking and higher price sensitivity (Hawkins and Baum, 2014; Markowitz et al., 2013; Simon, 2016).

[1] The lowest income group corresponds to less than 10.000 USD income per year (22.3% of mothers smoked during pregnancy), the highest income group

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* Corresponding author.
E-mail addresses: settele@econ.uni-frankfurt.de, sonja.settele@barcelonagse.eu (S. Settele), vanewijk@uni-mainz.de (R.v. Ewijk).

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In this paper we study the potential of cigarette taxes to reduce the propagation of socioeconomic inequalities across generations. We do this by analyzing whether cigarette taxes have heterogeneous effects on the next generation's cognitive and educational outcomes across different socioeconomic groups. Cigarette taxes have been shown to be effective in reducing socioeconomic differences in smoking behavior and in infant health. If tax effects translate into improved later life educational outcomes, then corresponding differences in these outcomes between socioeconomic groups will be reduced as well. One reason why we focus on tobacco taxes as a means of improving relative outcomes of underprivileged groups is their political implementability: Cigarette taxes potentially help to reduce socioeconomic inequalities without direct redistribution from rich to poor.

We exploit variation in cigarette excise taxes across U.S. states and over time and use data on educational outcomes from a large cross-sectional dataset, the American Community Survey (ACS). Information on mothers' educational attainment allows us to analyze heterogeneous cigarette tax effects across three broad maternal education groups as proxies for socioeconomic status: below high school, high school, and some college or more.

We find that prenatal exposure to cigarette taxes is strongly and significantly associated with better educational outcomes of 16-year-olds from the lowest socioeconomic group, while the effects are significantly weaker for children with an intermediate SES and vanish for children with a high SES. For a typical tax increase of 10 cents we find a substantial increase of around one percentage point in the probability that a 16-year-old from the lowest socioeconomic group has completed the ninth grade by the time of being surveyed. This effect corresponds to eight percent of the mean and implies a reduction in the gap between the lowest and the intermediate socioeconomic group by around 10% . We also find a strong tax effect on school enrollment and a slightly weaker effect on the probability of grade retention for those that are still going to school at age 16. We find suggestive evidence of a tax effect on cognitive or non-cognitive skills of the adolescent as reported by the parents. The effect is smaller in magnitude, more noisily measured and less robust than effects on educational outcomes. Still, the finding suggests that the estimated tax effect on educational success is at least partially driven by the human capital development of the child.

Looking at a restricted set of outcomes available for younger children, we also show that a heterogeneous cigarette tax effect is already measurable at ages 8–15. Moreover, for 17-year-olds we find very similar results as for 16-year-olds. Taken together, our results suggest that increased cigarette taxes are positively associated with the human capital accumulation of less privileged adolescents, thereby mitigating the transmission of socioeconomic differences to the next generation.

It is important to note that the mother's education, which we use as a proxy for socioeconomic status, is measured at age 16 of her child. Maternal education levels at that time could be correlated with tobacco taxes during pregnancy, for instance because cigarette taxes lead to improved health of the offspring, freeing up resources which the mother can spend on studying.

A correlation between cigarette taxes and maternal education could affect our estimates in two ways: First, there could be a direct positive effect of mother's educational attainment on her offspring's education. However, any such effect should be captured by controls for maternal education which we include in all regressions.

Second, there could be self-selection of mothers with different underlying characteristics into education groups based on cigarette taxes during pregnancy. In case cigarette taxes during pregnancy are positively (negatively) correlated with more mothers being in the lowest education group when their child is aged 16, this would improve (deteriorate) the average characteristics of mothers in this group. If unobserved positive characteristics of mothers, in turn, affect educational outcomes of the next generation in a positive way, this would lead to an upward (downward) bias in our estimated tax effect for the lowest socioeconomic group. Empirically, we find a weak negative correlation between the applicable cigarette tax and mothers' educational attainment. We show that the potentially resulting self-selection can explain at most between 1% and 6% of our estimated tax effects on adolescents' educational outcomes in the lowest socioeconomic group.

Our results are robust to a wide range of adjustments. We show that our findings are not driven by the family's income or the employment status of mother or father. Moreover, we control for a large range of state level policies during pregnancy (such as eligibility thresholds for Medicaid, smoking bans and the applicable beer tax) and after pregnancy (such as school financing reforms and the current cigarette tax) that have been shown to affect infant health or later life educational outcomes. Moreover, we make sure that our results are not spuriously driven by a changing demographic composition of the states' population over time. Even when we split the sample by maternal education groups and thereby allow for education-state-specific time trends, the general pattern remains the same. Lastly, we provide evidence that the estimated tax effect is likely driven by prenatal tax exposure as compared to correlated exposure in the first years of life.

Previous research provides evidence of a positive effect of cigarette taxes on birth outcomes (Evans and Ringel, 1999; Lien and Evans, 2005). In the study most closely related to ours, (Simon, 2016) finds that higher cigarette taxes improve physical health of 2- to 17-year-olds from cohorts exposed in utero as measured through sick days from school and doctor visits. Our paper is, to the best of our knowledge, the first to examine the effects of cigarette taxes on the educational success of the next generation and in particular to study their potential in mitigating the propagation of socioeconomic differences from one generation to the next.

We build upon a literature examining the overall effect of cigarette taxes on smoking behavior during pregnancy (Adams et al., 2012; Bradford, 2003; Colman et al., 2003; Gruber and Köszegi, 2001) and on infant health (Evans and Ringel, 1999; Lien and Evans, 2005; Markowitz et al., 2013).[2] Most of the studies examining heterogeneity by the mother's socioeconomic background point to a stronger tax effect on the smoking behavior of lower educated mothers (Hawkins and Baum, 2014; Markowitz et al., 2013; Simon, 2016).[3] Markowitz et al. (2013) document stronger cigarette tax effects on birth outcomes of children with a lower socioeconomic status, but due to low statistical power their results are mostly insignificant. In the online Appendix, we revisit the heterogeneous cigarette tax effect on birth outcomes, using a larger dataset and a larger number of proxies for infant health. We complement the existing evidence by documenting strong and significant heterogeneities in the tax effect on birth outcomes across socioeconomic groups. This validates our results on educational outcomes, which are the main focus of this paper.

At a more general level, we contribute to a growing literature on the effect of the early life environment on later life educational and other human capital outcomes.[4] Existing studies exploit variation from natural and policy experiments such as legislation on alcohol availability (Nilsson, 2017), the introduction of food stamps (Hoynes et al., 2016),

has 50.000 USD or more (2.7% of mothers smoked during pregnancy.) These numbers are from 2011.

[2] Other studies use identification strategies ranging from controlled experiments (Sexton and Hebel, 1984) to sibling studies (Tominey, 2007; Yan, 2013), minimum ages for cigarette purchase (Yan, 2014), smoking bans (Bharadwaj et al., 2014; Markowitz, 2008; Markowitz et al., 2013) and the 1998 Master Settlement Agreement (Levy and Meara, 2006) in order to analyze a causal effect of smoking during pregnancy on infant health.

[3] One study points to higher price elasticities of more highly educated mothers (Ringel and Evans, 2001).

[4] For an overview on the early life origins of human capital development, see also Currie and Almond (2011) and for the early life origins of general life-cycle well-being see Currie and Rossin-Slater (2015).